by a morbid impression upon a nerve-centre, diminishing, if not exhausting its motor or sensory capacity, as a *neural* function, without any necessary reference to the condition of its bloodvessels. We cannot but be satisfied that this will be the finally accepted judgment of physiologists.

Very much more must be done, however, if not by biological experiment, at all events by close pathological observation, to elucidate this complex subject. Great credit is due to the medical officers who have carefully collated and ably analyzed facts having so great scientific as well as practical importance; and it may be hoped that their opportunities and labours will meet with further extension in the same direction, unless, indeed, this be prevented by the ever wished for cessation of the supply of material from the victims of war. H. H.

ART. XVII.—*Die Krankhaften Geschwülste. Dreiszig Vorlesungen gehalten während des Winter-Semesters* 1862–1863 *an der Universität zu Berlin.* Von RUDOLF VIRCHOW, ord. öff Professor der Pathologischen Anatomie, der Allgemeinen Pathologie und Therapie, etc. etc. Erster Band, mit 107 Holzschnitten und einem Titelkupfer. 8vo. pp. 543. Berlin: Hirschwald, 1863.

Morbid Tumors. Thirty Lectures delivered during the Winter Term of 1862–63 *at the University of Berlin.* By RUDOLF VIRCHOW, Professor of Pathological Anatomy, etc. etc. Vol. I. With 107 Woodcuts and a Frontispiece on Copper. 8vo. pp. 543. Berlin: Hirschwald, 1863.

THE learned Professor of the Berlin School thus comes before the public in another work, rich with the fruits of his own investigations, and full of that astuteness and logical simplicity in his deductions, which are characteristic of his gifted mind. We may well be glad that the walls of his lecture-room have been thus expanded so as to include even the far-off corners of the earth. Those of us who have enjoyed the opportunity of listening to his silvery utterances, will not fail to hear them ringing in our ears, as we peruse these pages, and will appreciate the force of that remark in the author's preface, where he says, it would be impossible to reproduce all the illustrations which were presented to his class. We can well imagine the hundreds of crayon sketches which were dashed off upon the blackboard with the readiness and skill of artistic genius. The work forms the first part of the second volume of *Lectures on Pathology;* those on Cellular Pathology forming the first volume. Like the latter, the present series are stenographic reports from the speaker's mouth, revised by him, and altered somewhat so as to adapt them to the press. The multitude of duties, both of a scientific and political character, banished from the Professor's mind all hope of producing any original work during that winter, save in this method. The present subject was chosen, partly because the author had devoted much reading and observation to it, partly because it was one in which the literature of our profession was, as it seemed to him, lamentably deficient, and partly because the views promulgated were, in his opinion, unsound. Differing from the humoral pathologists, he takes his stand upon his own ground of cellular development, works out the classification of tumours from a genetic stand-point, from the tissues in which they have had their origin, and traces their development in accordance with the analogy of other well-known and established pathological processes. Throughout the work the remarkable erudition of the author is made apparent, and in no case are conflicting views kept out of sight; they are, rather, clearly exposed and ably combated. We propose to give the reader a brief *résumé* of the work.

The first lecture is devoted to defining what is to be included under the head of tumours, and to indicating what principles should govern their classification. The limits within which we should apply the term tumour are not placed by the nature of things, but merely by practical necessity. Scarcely any one would class under the head of tumours the actual *tumour inflammatorius*. Hydrocele is reckoned among tumours not from its own nature, for then hydrothorax might as well be added, but because at times the diagnosis may not be clear; it may be uncertain whether there is an actual tumour, *e. g.*, a sarcocele, or whether there is merely an hydrocele. On the other hand, carbuncle, anthrax, and abscess are excluded, because there is no difficulty in the diagnosis. The practical value of the designation is to include those things alone in which there is danger of an error in diagnosis.

Nor can we substitute, as some have done, the word *pseudoplasm* for tumour, for that implies a distinct genetic point of view, which is not applicable, *e. g.*, to hydrocele, nor to many of the cystic formations. The foundation of every system of classification of tumours, be it ever so contracted or ever so comprehensive, must be genetic. The first and most important question is, what is the origin of the tumour? Formerly attention was directed to the coarser anatomical character of a tumour, to its being malignant or non-malignant, to its appearance and external form, and its consistency or degree of resistance was considered a point of the utmost importance. Hence arose the names cancer, nodule, tubercle, polyp, fungus, &c. But the form has no necessary relation to the internal structure of the tumour. To be sure some tumours regularly assume a given form, as, for instance, the cauliflower excrescence (*tumour cauliflorus*), but this is merely a subdivision of warts or of cancroid tumours, for which subdivisions the descriptive name applies very properly. So names have been given which refer to the consistency of tumours, as hygroma, meliceris, colloid, and atheroma. These terms are still employed, but now we know how the contents of these tumours are produced, of what composed, how the tumour as a whole exists. We do not now designate as atheroma every tumour which has a pultaceous feeling, for the contents of some cancerous and cancroid tumours have, at certain stages of their development, an atheromatous character. This separation of things apparently similar, but in their existence and significance vastly different, is a severe task. To say that this is a scirrhus and that a steatoma does not decide the nature of the tumour. Formerly a scirrhus was something by itself, and a colloid tumour something by itself, but now we have a scirrhous cancer and a colloid cancer. A great step forward was made when pathologists became convinced that certain tumours resembled certain parts of the body; hence came the term fatty tumours. Abernethy went still farther, and recognized tumours which resembled the more complicated structures of the body, and spoke of a pancreas-like tumour. But all these attempts led to no permanent result, because the basis of an exact knowledge of histology and embryology was wanting. Neither the study of the tissues, according to Bichat, nor the embryology of John Hunter and Haller sufficed to establish a classification. It was only by the labours of Swann and Johann Müller that the finer anatomy of the tissues and of tumours became the subject of scientific investigation. We can now, by following the path which they indicated, present an almost complete classification founded upon an anatomical genetic basis.

In the next lecture upon homology and heterology, in the domain of tumours, the author establishes the fact that a tumour cannot exist in the body as an independent thing. It is a part of the body, not merely connected with it, but proceeding from it, and subject to the same laws. Every kind of formation in tumours, whatever it may be, actually agrees with known typical forms in the body, and the real difference between various tumours rests upon this principle, viz.: tissues, which are in themselves normal, appear in the form of tumours, sometimes in parts to which they actually belong, and sometimes where they are abnormal; the first is homology, the second heterology. Still farther, the same kind of tumour may be at one time homologous, at another heterologous, according to the tissue from which it proceeded. Thus, a cartilaginous tumour on the cartilages of the ribs is homologous, because cartilage existed there previously; but when the same tumour is found in the testis it is heterologous.

This division has also a practical value, for, in general terms, homologous tumours are benign, heterologous, malignant. But not all heterologous formations are alike malignant; there exists, as it were, a certain scale of malignancy, the lowest degrees of which are all but benign. With such a division we have, on the one side, those formations from which no uncommonly injurious effect upon the body will be anticipated, upon the other, are those which might even cause suspicion. And thus we have a foundation for the classification of tumours from an anatomical genetic point of view, carrying with it a physiological significance and a practical value.

The general physiology of tumours is next considered. As for the etiology and genesis of tumours there are three points to be considered, the exciting local cause, predisposition of the part, and dyscrasia. The latter is regarded by the author as a deuteropathic phenomenon; not that the original tendency is in the blood, but that there is an absorption, a taking up of material from a tumour already existing. The original tumour is an infecting mass, and hence the frequent reproductions after surgical operations; the tissues have imbibed the infection, and the operation is not performed in sound tissue. The tissue was *apparently* sound, but the line of infection is not discernible. So when the same formation is observed in other parts after an operation. It is a much more scientific method, and one borne out by facts, to suppose that the disease was already present at those points, but not in the amount to attract our attention. Neither the recurrence of tumours at the point of operation, nor the appearance of similar tumours in distant organs, or, as it has been latterly termed, generalization, are to be considered as phenomena, independent of the original tumour, as the working out of a dyscrasia in these parts. In the vicinity of the original mass new accessory masses are constantly formed, and that which we have at last, is a multiple of these smaller masses. The original *mother nodule* grows to a certain size and stops; in the meantime, in its vicinity, a new zone of these small masses is formed, and these at last touch each other and the original mass; then a new zone is again formed and so on. From the original nodule a given irritation is conveyed to the vicinity, and these parts are subjected to a diseased action similar to that which affected the original point. The accessory nodules proceed from the growth of the cell elements of the surrounding parts. The irritation is caused by fluids produced in the mother nodule and passing into the tissues by imbibition. Certain inflammatory processes extend in the same manner. In erysipelas and in the *plaques muqueuses*, just as in scirrhus there is an original infecting substance, generated at the original point of departure, and carried onward partly by simple exosmosis, partly by the lymphatics, to the nearest lymphatic gland. But sometimes morphological forms—cell elements—are set in motion, and the lymph vessels themselves have been found filled with the products of a tumour. So is it also with the veins. The author admits, therefore, as a possibility, that portions of tissue may be detached and carried forward, and may become new sources of disease. Probably both forms of contagion occur, but the purely humoral is the most important.

The etiology of neoplastic tumours is then considered. As the theory of a dyscrasia is less satisfactory than that of secondary infection in the explanation of the extension of the tumour, so does it also fail to account for the original point of departure. Cachexia is often the result rather than the cause. The state of the fluid elements is by no means unimportant; but there is a wide difference in regarding these circumstances of dyscrasia, these disturbances of nutrition as the predisposing, or as the essential cause. The neuro-pathologic origin of tumours, as advanced by Van der Kölk, is disputed by the author. Finding neither in the blood nor in the nerves the origin of tumours, we are led back to the tissues. Here an important fact is the local disposition, and under this comes hereditary character. Some tumours, *e. g.*, nævi, are congenital, but the more important classes are those in which the disease is indeed inherited, but first developed in the later periods of life. Points which have been previously the seat of actual disease may in the later periods of life be the seat of a tumour, as when a cheloid tumour is seated upon the spot of a scar. In mucous membranes too, tumours are generally seated on points which have been previously subject to inflammation. Again they may arise in parts particularly exposed, whether from position, arrangement, or function, to injuries or disturbing causes. Thus, when the testicle does not descend, but lies between the structures of the abdominal wall, it is much more frequently the seat of malignant tumours, than when it is retained in the abdominal cavity. To the local predisposition, therefore, the greatest importance is to be attached, and this importance is still increased when a part has been deprived of its regulatory capacities, and when, at the same time, the general condition of the body is unfavourable. This becomes still more evident in proportion as it is shown that certain organs are particularly disposed to certain diseases.

For all tumours there is a certain point of predilection. Tumours which are common in certain organs, are never found in others. Opposed to this predilection there is also a certain immunity. These remarks apply to the original tumour, upon which the secondary tumour is more or less dependent. We may almost say that those organs which are inclined to protopathic formations are seldom the seat of metastatic tumours, and *vice versâ*. The author is led to the conclusion that, even in malignant tumours, the mother-nodule does not proceed from a dyscrasia; at all events it must be a dyscrasia altogether different from that which calls forth the metastatic nodule. Mere multiplicity must not be confounded with metastasis; the former is merely an extension of the local disposition. When this is extended over large portions of the body it may be designated constitutional diathesis. Even in cases where there is a specific dyscrasia, as in syphilis, we must come back to the local causes, whether occasional or predisposing, in order to determine why this organ, and not that, is attacked.

The fifth lecture is upon the pathogenesis of neoplastic tumours. Little attention has been paid to the consideration how tumours exist; how the same tumour, from the locality or the peculiar circumstances under which it is formed, may assume various forms, offering varieties, as it were, varieties so marked that we almost think them another sort of tumour. A tumour must be considered as always in process of development; even when it has reached its acme, it does not remain stationary; beyond this acme new alterations occur. Tumours, for the most part, originate in active processes, whether of increased secretion, or exudation, or of actual formation, processes, in fact, which must be regarded as irritative. Hence, the stadium of *irritation* is the first we would notice. This irritant may arise from external or internal sources. The nature of the irritant differs according as it is chemical, as we suppose it to be in dyscrasia, or mechanical. The direction in which the development of the new tissue occurs differs, on the one hand, as the tissues themselves are different upon which the irritant acts, and on the other, as the acting substance may have a particular chemical effect, giving peculiar qualities to the irritated tissue, just as the ovum is acted upon by the seminal fluid. We know that there is in tumours a defined mother tissue, a matrix, from which, by proliferation, the tumour exists. The elements of these tissues expand and appropriate more material; nucleation, or division of the nuclei succeeds, followed by an increase of cells.

If this proceeds rapidly, and if the cells diminish in size in proportion as they increase in number, a second stadium is reached, which the author terms *granulation*. In this stage the tissue is, as it were, indifferent; the cells are generally small and round, at the most having a nucleolus and granular contents; these are the formation cells, and have proceeded from the previous elements of the part. Sometimes, however, this course is not pursued, and the division of the elements leads directly to typical forms, as in direct hyperplastic formations. But these developments are more frequent in the more indifferent tissues. The actual connective tissue is, however, the most frequent point of departure for the tumour. Between the matrix and the tumour there is no exact boundary. Judging by the consistency of the part, the vascular condition, and the chemical character of the tissues, we think we discover the boundary line, and say this is tissue, that is tumour. But if we look beyond this point, in the apparently healthy tissue, we find the rows of the last produced proliferating cells; and hence it is that so frequent recurrences *in loco* follow extirpation.

After this stage of granulation comes the point of *differentiation*, when not merely one tissue develops one tumour, and a second tissue another, but when, in the same tumour, one part develops one tissue, and another part a different tissue. There are tumours with an entirely simple and uniform character of tissue; one part may be older, another more recent, one thicker, another thinner; but the tumour actually consists throughout of one and the same tissue. These the author calls *gewebsartige* (tissue-like) histoid tumours. In another group the formative cells develop in different ways, as into connective tissue and epithelium; alveoli may be formed, vessels may become developed, and thus a complex formation is established, resembling the organs of the body. These are called organoid tumors. But this manifold variety of forms in the tumour may be still farther increased, and the tumour may come to resemble a collection of organs, a system of the body, as, for instance, the skin. There may be not merely the correlatives of the connective tissue, and of the epidermis, but also of the glands, as of the sweat and sebaceous glands, and even of the hairs, and all the other parts pertaining to the skin. These forms the author designates as teratoid.

When the tumour has reached this point of the formation of characteristic tissues, it has arrived at the *stadium florescentiæ*, the fourth stadium, in which its elements have reached their typical acme. But how are we to recognize this typical acme of development? There are two methods; the first, though often uncertain and indecisive, is by the agreement of the elements with known typical and perfectly developed elements of the body; the second and more certain is when we can perceive from the further course of the tumour that the elements, after having reached a certain height undergo no subsequent development. But here a distinction exists between the simple histoid tumours and even individual parts of the more complicated tumours; for the latter have a transitory character, a short existence, while the former acquires a more lasting character, and its products may become incorporated as permanent components of the body. Hence, we obtain a practical fact of great value. The more permanent are the elements of the tumour, the more readily may it become a permanent part of the body. An individual may carry such a tumour his whole life long. But as the elements of the tumour are more destructible, and have but a short life, so much the more certain is it that the tumour cannot become a permanent part of the body; that, at least, the old portions of the tumour cannot continue; new outgrowths may give it this appearance, but it is appearance only.

The tumours consisting of perishable elements differ again in the relative duration of these elements. From the first there is a tendency to destruction. In the interior of such a tumour there is a perpetual destruction, a perpetual dissolution, a perpetual retrogression; and this is the sixth and last stadium, viz., that of *retrogression*. Under this are classed the processes of fatty metamorphosis, softening, induration, and calcification. This course of development, through these successive stadia, the author has established for cancer, colloid tumour of the ovary, enchondroma, cholesteatoma and many others.

The sixth lecture lays the foundation for a systematic arrangement of tumours. The author excludes, to begin with, all simple tumefaction of merely an inflammatory character, whether as hypertrophy or as hyperplasia; so also unproductive cysts, as those found in the brain and called apoplectic cysts, and those formed by the cysticercus, &c. Tumours are divided into two general classes—those which do not exist by any individual growth of their own, and those which do. The former comprise cystic tumours, the latter the pseudoplasms or growths. The former may arise in various ways; they may proceed directly from the blood, or from the accumulation of material secreted in a peculiar manner. Those which proceed from the blood may be of three varieties: 1st, blood in substance or *extravasations;* 2d, exosmosis of the watery, saline, and albuminous elements or *transudations;* 3d, the addition of a certain amount of fibrin not from the blood, but, as the author thinks, from the tissues, and constituting *exsudations.* These may, however, appear under complicated forms, and we may have a hemorrhagic or a serous exsudation.

Again, we may have tumours in which there is a deposit of materials, the nature of which is determined by the character of the surface from which they proceed. The secreted material may be in some chiefly fluid, in others chiefly organized matter, and in others still a mixture of the two. As an example of these last respectively, the author cites a cyst filled with pure mucus, a cyst filled with cells cast off from a normally secreting surface, as the epidermis, and lastly, one filled with cells cast off from a gland and mingled with the watery substance. Thus these cysts form a class by themselves, designated as tumours caused by *dilatation* or *retention* from the fact that the fluids and organized parts accumulate in a previously existing space. Of the two classes already mentioned, leaving out of consideration the entozoa and the simple tumefactions, it is the exsudation and extravasation tumour which approximates the most closely to known pathological processes. Then come the dilatation and retention tumours.

To these is added the third and last group, viz., the actual pseudoplasms or neoplasms, originating from *proliferation,* growths in the most strict sense of the word. Of these we have already spoken, subdividing them into histoid, organoid, and teratoid tumours. But our classification is not yet complete, for we must add still another division, viz., that of *combination* tumours, in which not merely the different proliferation tumours may be combined, but in which these forms may be combined with exsudation and extravasation forms, with dilatation, and in part with newly formed sacculi. These latter combinations may exist in two ways, either the cyst exists first and the neoplasm originates from its walls, or the neoplasm is first present and produces dilatation; possibly still other tumours may be developed in the cysts thus formed, as in cysto-sarcoma. This separation of two apparently similar forms is of the utmost importance, for the one variety is quite innocent and purely local, while the other is of the utmost gravity and malignancy.

We have thus a complete classification from an anatomical genetic point of view. It must not be supposed, however, that all tumours can at once be ranked in one or the other of these classes; that we can at once say which are innocent, and which malignant. The proliferation tumours must be again considered as to their homology or heterology in the author's sense of those terms. In general terms homologous forms, however important they may be by their position, size, connections, and influence, are still innocent formations; among these the retention and exsudation forms belong. Everything else is at the least suspicious. Every heterologous formation is not, however, malignant. As we have said there is a scale of malignancy, and consequently of heterology. When, therefore, a cartilaginous or osseous tumour exists in the connective tissue, or when a mucous tumour occurs in the adipose tissue, they are by no means so heterologous as an epidermoid tumour in the connective tissues, or as a tumour composed of cylinder epithelium in a lymphatic gland. To be sure a cartilaginous tumour in the connective tissue or in bone substance is heterologous, but by no means as much so as an epithelial or a muscular formation would be in the same place. Still more important, however, is the relative proportion in which the tumours create fluid material. Herein lie the worst characteristics, and the greater capacities for infection—the *virulence* of the tumour. The more poorly supplied a tumour is with vessels, the more will it infect the immediate vicinity only; but the richer it is in bloodvessels and lymphatics, the more blood and lymph passes through it, the more the blood is brought in contact with its parenchymatous fluid, so much the more easily will the infection become general. This, the author admits, is his own interpretation, but it is borne out, he says, by his experience.

We have thus laid before our readers, more in detail, what we consider as the most important part of this valuable work. Here the author's acumen and genius are fully developed; every page is rich in material for earnest thought and full of instruction, bearing in every line the impress of the author's gifted mind. Of the rest of the volume we can take but the most cursory glance, contenting ourselves with the more full elucidation we have given to the principles which underlie the whole. The author proceeds to the consideration of the various classes of tumours, and, first, the—

Extravasation forms—sanguineous tumours, or hæmatoma. These are of three forms: 1st. The cystic. These may arise traumatically or mechanically from an internal solution of continuity. They are exemplified in *neonati* upon the head; in adults, upon the ear, upon the dura mater, in the dissecting aneurism, and in the extravasation following the rupture of a muscle. 2d. The forms without cysts, and where the blood seems to form a firm nodule, as upon the valves of the heart, or where the blood is more equably distributed through the parenchyma of the organ, giving it the appearance of a sponge saturated with blood, as in the ovary, and as in the thrombus vulvæ of parturition. 3d. The polypoid form, as the polypoid hæmatoma of the uterus, and the hæmatocele uterina, or hæmatoma retro-uterina, where the blood is collected in Douglass's sac.

Then the author takes up the second class—the transudative and exsudative tumours—hygroma, serous tumours; and as a type presents hydrocele. A hemorrhagic character may be added, and the hydrocele may be merged into a hæmatocele. At the same time there may be hyperplastic thickening, sclerosis, in short, at the surface. Adhesions may be formed, synechiæ, and with the hydrocele there may be partial obliteration of the tunica vaginalis. If the sclerosed tunic becomes very much thickened, and remains so for a long time, we may find calcification of the tissues as in the pericardium. Or we may find upon the surface of this tunic a partial proliferation, manifested by abnormal outgrowths; the pedicle of these last may become detached, and we have the free bodies of the tunica vaginalis described by Sir Astley Cooper. All these conditions are the results of irritation, and belong partly to the secondary and partly to the formative groups of the phenomena of irritation; the more the formative element predominates, the nearer does the tumour approach the neoplastic forms. These various conditions of the tunica vaginalis must be kept in mind, both in forming the prognosis and in the treatment. If this membrane is in a cartilaginous condition, or is tending to that condition, its tissue is but poorly supplied with vessels, hence there will be but slight tendency to the existence of adhesive processes. Therefore, if, as is commonly the case, the fluid is evacuated and iodine injected, a more determined inflammatory process is induced, combined with softening, and the formation of pus upon the surface. In such a case it is almost impossible to pursue a course of treatment which shall result in a cure; and hence removal of the part is the indication, because its condition cannot be improved, it is useless in itself, and it causes great discomfort to the patient by its vulnerability.

Hydrocele of the neck and back are then considered. In speaking of the tumour of spina bifida, the author remarks that the sac frequently has an external depression, which is sometimes funnel-shaped; when the sac is laid open, this depression is found to correspond with the insertion of the end of the medulla spinalis. The principal part of the serous deposit lies within the arachnoid around the spinal marrow and the roots of the nerves; it is only occasionally that closed serous sacs are found at the same time in the dura mater. It is of the utmost importance in the history of spina bifida and hydrocele cerebri, to know whether we have to do merely with the membranes of the spinal cord and of the brain, or whether the nerve centres are at the same time involved. With the first we may hope to bring back the normal condition by an evacuation of the fluid, while in the second we can only anticipate the most severe injury. But aside from the treatment, there is the greatest difference in the symptoms. Spina bifida, when combined with hydrorachis interna and especially with atrophy or solution of continuity of the medulla spinalis, brings with it of course incurable paralysis, while the simple hydrorachis externa produces merely local disturbances, or perhaps no apparent results. The latter is the case when the tumour is perpetually covered by the skin and the other soft parts. Some forms of this class of tumours may be carried even to a late old age without injury. Of course the most favourable location is where there are the fewest nerve bundles, *i. e.*, the sacral region. The author cites one case in a woman 23 years old, in which the tumour was as large as a child's head, and had been frequently punctured. All forms of spina bifida between the sacrum and the termination of the spinal cord belong to this more favourable category; the higher the sac occurs the more grave is it; and in the cervical and dorsal regions we are almost sure to find not merely the membranes, but also the nerve centres affected; or, to use the author's terms, we have not simply a hydro-meningocele, but a hydro-myelocele.

Passing to the consideration of the tumours of the next class, the retention tumours, he recognizes as their distinguishing feature an individual secretion, which is not merely an exosmosis from the blood, but rather a product of the activity of the tissues; and this secretion constitutes the accumulation. Either it is secreted by the walls of the sac, and then it is merely a local phenomenon; or it is secreted at a point removed, and is not expelled from the given system, as in the case of glandular secretions, which are retained in the emunctory canals. In general the open spaces which already exist are the seat of the accumulation, and these are usually canals, the tumour acquiring its cystic character from a dilatation of the walls of the canal. If a perfectly closed cyst has thus been developed from the walls of a canal, there must have been an adhesive process, an obliteration, and this presupposes an inflammatory or at least an irritative character in the local process. The character of the contents of these cysts is very various and uncertain. The original secretions themselves become altered, and new products are added whether of a secretory or of a transudatory or hemorrhagic character, and thus the original character is entirely lost. Hence it is necessary to recognize various stages in their formation, and it is only in the initial stadium that their specific secretions exist in their purity.

Follicular cysts or atheroma are first considered. As a rule it is the hair-follicle which is the seat of the retention; the lesser accumulations constitute what we call comedones, the larger forms constituting atheroma in the more ordinary use of the word. In all the larger atheroma there is a pericyst or a membrane of cellular tissue, and within this, the layers of epidermis are accumulated somewhat like the layers of an onion: the internal layers of epidermis are always the earliest, the external the last cast off. Another aid to their growth is found in the new sebum, which is furnished. Of a corresponding nature are the mucous cysts or hydatids of the mucous membranes; and these are found in all the forms corresponding to the atheroma. It is their chronic form which we recognize as polypi. We sometimes find upon the female sexual organs all the various forms combined; nowhere is the cystic polyp more common.

We pass to the third division, the proliferation tumours, the consideration of which the author commences in the thirteenth lecture. The proliferation tumours, growths, neoplasms, are distinguished from those hitherto considered by the fact that the development of a new tissue in them is no product of a later period, no accident complicating the formation or perfecting it, but that this new tissue constitutes from the commencement the tumour—it is the tumour. Whatever other alterations may occur, and give rise to hemorrhage, exsudation, or retention, or to the formation of cysts in and approximating to the tumour, are in relation to the neoplasm secondary and accidental; for the neoplasm proceeds from the old tissues, and they serve as matrices. Thus we have to consider a large number of processes, all of which have in themselves, undoubtedly, an active, productive, irritative character, and which extend from the simplest inflammatory forms to those most clearly marked as heterologous and malignant. But this great domain can be divided into groups, as we have hinted above, according as the growth is more simple or more complicated in its structure; as it is composed of a single tissue or of a combination of various tissues. The difficulties attending a division are, however, apparent when we remember that the vast majority of the proliferation tumours proceed from the connective tissue scattered throughout the body, to which, in addition to the actual connective tissue, we also trace cartilage, bone, fat, marrow, and still other tissues.

The author commences with the fibrous tumours, *fibroma*, rejecting the name fibroid. He excludes from this group the so-called fibroid tumours of the uterus, because these have been found to contain muscular fibres; so also he excludes the nodules occurring in the nerves, the so-called neuroma. Fibroma appears, in general terms, in three forms: 1st, in the more diffuse form of elephantiasis and its allies; 2d, in the more limited nodular, tuberose form, or, as the dermatologists say, tuberculosis; 3d, in the form of papillary outgrowths. The reader will find the author's exposition of elephantiasis (arabica) exceedingly clear and instructive; we have never met with a more satisfactory treatment of that whole subject. Allied to the first group is the fibroma mammæ diffusum, the induratio benigna, as it was termed by the older surgeons. Among the papillary forms are included the broad and pointed condyloma, as also the condyloma subcutanea, or follicular condyloma. The fibroma shows a special tendency to form combinations with other tumours; in particular the limitations of the tuberous form are not well distinguished from sarcoma; indeed, there are many transition forms, and the limit will depend very much upon the observer's own will. Among these latter may be reckoned the degeneration of the fibroma, and in this way the fibroma may become secondarily cancerous, cartilaginous, cystiform, &c. The tuberous form may have its seat in the skin and subcutaneous tissue, as it does in elephantiasis, molluscum, and the papillary forms; or it may be in the fasciæ, and it here may be either unilocular or multilocular; here, too, besides the simple form of fibroma, we may have the fibroma mucosum, or the ossifying or petrifying fibroma. The fibroma may be seated also in the periosteum. In the worst forms we may be uncertain whether the seat is in the fascia or in the periosteum; and as an instance of these we have the retro-pharyngeal tumour and the naso-pharyngeal polyp. In other portions of the body the tuberous forms do not occur, or at least only in such isolated and diminutive forms that they may be considered as belonging almost to the papillary form. This is true of the fibrous polyp of the larynx, which has its seat upon the thicker portion of the vocal chords. All these forms are hyperplastic, entirely homologous. The fibroma have only a local signification, and are to be considered as benign. However much they may extend, they have no tendency to ulcerate, and still less to infect. Indeed, many assume spontaneously a retrograde action, undergoing gradual atrophy and resorption. There are also heteroplastic forms; not, however, in the sense of malignancy, but of a development, producing a type different from that of the matrix-tissue. This form is most common in the bones, proceeding either from the osseous tissue itself or from the marrow; but the most marked cases of heteroplastic fibroma afford a favourable prognosis, when completely extirpated.

The second class of proliferation tumours are the *lipoma* or fatty tumours. They consist of the actual *tela adiposa;* the cells of the tumour, however, are larger than those of the adjoining adipose tissue, and show an irritative origin. Every lipoma has a lobulated structure, and each lobulus is surrounded with a vascular capsule of connective tissue. In certain tissues we find that the cells of the connective tissue have a special predisposition to the appropriation of fat; such are the sub-serous, sub-synovial, and sub-mucous tissues, and so also the interstitial tissue of the muscles. The lipoma are hyperplastic or heteroplastic; as an instance of the latter, we have the fat nodules in the kidney. The multiplicity of lipoma, with which we meet is an entirely different thing from the multiplicity we find in malignant tumours and in an infectious dyscrasia. Here it merely shows the presence of an irritant in the adipose tissue, which is not equally distributed throughout. Every lipoma must have a local cause, though this may be obscured by predisposition, and this last may be either congenital or acquired. The lipoma may exist through a whole lifetime, or it may undergo spontaneous retrogression, induration, or calcification, and the latter may be in an amorphous manner, or more like bone. It may also terminate in ulceration, and this may take on a septic character, but it never passes into a malignant form; those which are considered such are doubtless no pure lipoma, but combination tumours. Sometimes the lipoma may form an abscess.

The next group of proliferation tumours are those proceeding from the mucous tissue, the tumores muscosi, or *myxoma.* These are to be distinguished from mucous cysts, in which the mucus, as a secretion, forms the tumour. Here the mucus is an element of the tissue; it belongs to the intercellular substance of a tissue, which from its relative structure is included in the great class of connective tissues. It may be called an immature adipose tissue, inasmuch as it afterwards is transformed into the latter, either by its cells taking up fat, or by their first enlarging, and ultimately forming fat lobes. On the other hand adipose tissue may degenerate into mucous tissue. The two tissues are parallel conditions of one and the same tissue. The mucous tumours are both hyperplastic, and heteroplastic, homologous, and heterologous, but they are all distinguished by great elasticity and softness; they may even exhibit fluctuation, and when cut they have a jelly-like consistency, sometimes more solid, often almost liquid; the cut surfaces when pressed give out a glutinous tenacious fluid, like the white of an egg, or mucus. Besides this fluid, which is intercellular, there is a fibrous basement structure. The tumours commonly called colloid, most probably, belong to this category. Paget names them fibro-cellular. They are most common in fœtal life, and a typical form is seen in the mola hydatidosa of the placenta. They do not occur very commonly in adults, and when they do it is upon places where there was a large deposit of fat, where the connective tissue was of a spongy character. They may be subcutaneous or intra-muscular. They occur upon the thigh, in a polypoid form upon the breast and the vulvæ of women, in the hilus of the kidney, and in bones; in the latter they proceed generally from the marrow. These forms of myxoma are hyperplastic, but the heteroplastic are the most common, and under the latter belong a large number of tumours of the brain and of the nerve-centres. Many tumours described as cystic neuroma belong here. Still more heteroplastic are the forms occurring in the breast of women. As for the significance of myxoma, the hyperplastic forms are of a more local character, and an operation removes the evil. The limits, however, between the two forms are very difficult to determine, and the intra-muscular forms are in this disputable category. The heteroplastic forms have a great tendency to extend and to recur.

The closing lecture of this volume is devoted to the *chondroma* or cartilaginous tumours. These are divided primarily into the ecchondroses or the hyperplastic forms, and the enchondroma or the heteroplastic, heterologous forms, although the latter do sometimes arise from cartilage substance. The first group proceeds from the permanent cartilages. When the second proceeds from cartilage it is from a transition cartilage, which was not transferred into bone at the proper time. The ecchondroses: these are found most frequently upon the cartilages of the ribs, then, next in order upon the synchondroses, as of the symphysis pubis, and then upon the permanent cartilages of the respiratory organs. In all these we have, at first, a simple ecchondrosis, but this may, afterwards, undergo various modifications; it may ossify, and we may ultimately have an exostosis, which, however, has proceeded from cartilage, or it may take on a retrograde action and assume an amyloid induration; or from the cartilaginous stadium new developments are made, so that the interior of the cells is full of little sacculi, and the whole formation may have almost the consistency of mucus. A transition point from the hyperplastic to the heteroplastic forms is offered by the—

Ecchondrosis of the articulations, which in their later development form the free or movable bodies of the articulations, known since the time of Ambrose Paré. These are often found in great abundance in the kneejoint, and are productive of great pain and discomfort. Their movability depends very much upon the number present; if it is a solitary one it is, of course, very movable; but the joint may be so full of them, and they may be so large, that they are entirely stationary. The question arises, whether they proceed from the cartilage, and are therefore ecchondroses, or from some other tissue, and must therefore be considered heteroplastic. Experience teaches us that both forms exist. The cartilage itself grows, and in some cases develops these outgrowths; in others they arise from the periosteum and the synovial membrane. The idea that they are originally fragments from the end of a healthy bone cannot be proved anatomically. They generally originate as pediculated outgrowths, and at length lose their attachment; after which they seem to undergo but little alteration. They are the results of irritative processes.

This leads us to the heteroplastic forms, the enchondroma; and these are again subdivided into the enchondroma proper and the osteoid chondroma; although, here again, the dividing line cannot be marked with perfect accuracy, as the two forms often run into each other. In the enchondroma proper, there are, as in cartilage itself, three distinct forms, the hyaline, fibrous, and reticulated cartilage; but these three may exist in one and the same tumour. It occurs in places where cartilage should not be formed, as in the bones, where it is most frequently observed, and also in the soft parts, as in the salivary glands, in the testes of men, and the breasts of women. It is found the most frequently in the earlier periods of life, and hence an argument for the possibility of a cartilaginous origin; sometimes it has been found to be congenital; in most cases it shows itself in the first decades of life. When such cases are presented to us, the history of the case shows that they have existed for long terms of years. From these facts the author thinks it probable that in the first developments of the bone certain irregularities have occurred, which give a predisposition to the formation of the tumour; that while the bones were growing, certain fragments of the original cartilaginous deposit did not ossify, and that these became afterwards the point of departure for the tumour. The enchondroma of the soft parts offer still less satisfactory indications for an opinion as to their origin. Without any great number of statistics upon which to base an opinion, the author thinks that they occur most frequently among women as enchondroma of the sub-mucous tissue, while those of the bones predominate in men. In no class of tumours do we find a traumatic origin so frequent as in these; fractures of the bones have been frequently known to result in the formation of enchondroma. They may also arise from chronic inflammatory processes.

The enchondroma of the bones has a certain predilection for individual parts of the skeleton. The bones of the hands and feet, the phalanges of the hands and the metatarsal bones of the feet, are the most frequent seats. Then comes the humerus, more frequent than the bones of the forearm, then the tibia and the femur in about the same ratio; the fibula is much more seldom affected. Of the bones of the trunk and head, the maxillary, the pelvic bones, and the scapula stand first; then the ribs, and the cranial bones, especially those of the base of the skull; least of all are the vertebræ, the clavicle, and the sternum affected. The greater number of these proceed from the body of the bone, a smaller portion from the periosteum; hence there are two groups, the central and the peripheral, or the internal and external. If it originates internally, it may remain latent a very long while. Those of internal origin generally proceed from the marrow, and have an areolar, and even lobular formation. The author establishes his theory of multiplicity from infection; each secondary point of departure is a result of this process. The peripheral forms are developed in the later years of life, and occur frequently in the pelvis, where the central form is seldom observed. These are raised much above the surface of the bone, gradually surround it, and send forth outgrowths in various directions. The subsequent history of the enchondroma of the bones, as well of the harder as of the softer forms, shows that they undergo a mucous-like softening, but this is much more common with the latter variety; thus a multilocular cyst may be produced, and it may be very difficult to determine what is the exact character of the cyst; we may be led to consider as a hygroma or a cysto-sarcoma, what is actually an enchondroma. The fluid in the cyst may become putrescent and lead to ulceration. The harder varieties have a greater tendency to calcification and ossification. The enchondroma of the bones is by no means as innocent as Johann Müller thought. From the extension into the soft parts masses have been carried into the lymph and bloodvessels, and metastatic forms have been noticed by the author.

The enchondroma of the soft parts resemble that already described in its forms of development, and its metamorphoses. These are, however, not simple in their character, but belong most frequently, especially when in glandular structure, to the class of combination tumours. The cartilage may be either lobular or nodular, and its substance is here also either hard or soft; the former variety being at one time of a hyaline, and at another of a fibrous, or reticulated character. The termination in softening is here much less frequent, while calcification and ossification are much more common. The cartilage is developed from the connective tissue, and is the result of an irritative process; in the glands it proceeds from the interstitial connective tissue. This form of enchondroma is very frequently observed in the lungs; here it exists in all its purity, having the character of permanent cartilage and exhibiting the processes of calcification and ossification. The author speaks here of the idiopathic and not of the metastatic enchondroma of the lungs. Next to the lungs the subcutaneous tissue and the fasciæ, and the submucous tissue in a limited degree are the seats of the pure enchondroma. Among the glands, it is, as has been stated, the salivary and the sexual, which are chiefly affected, and among the former, the submaxillary and the parotid. The enchondroma may be either diffuse, affecting the whole of the gland, or lobular, affecting only certain lobes; the former is seldom seen in the parotid, while it is the most common form in the submaxillary. The sexual glands in woman are much less frequently affected than in men. In the testicle it generally occurs complicated with some other kind of tumour. We thus see that the enchondroma of the soft parts is a heterologous formation, and therefore at all events suspicious; even when it is originally purely local, its enlargement by the formation of new nodules proves its capacity for infection. The enchondroma of the bones as well as that of the soft parts possesses this capacity of infection, and hence as a rule we would do well to extirpate them as early and as completely as possible. We cannot as yet draw the limits between the innocent and the malignant forms. In general, perhaps, the softer forms are more dangerous than the harder, but this distinction is not altogether clear. Of much greater significance is the nature of the organ affected, and especially its richness in lymphatics and bloodvessels, conditions which are exemplified most clearly in the testis.

The author then reverts to the osteoid chondroma which forms the most extensive bony tumours. At first they have some similarity to the peripheral enchondroma of the bones, but they soon surpass them in size; they have an irregular surface, and surround the entire bone. They are chiefly found upon the long tubular bone, and in these, upon their extremities, as upon the lower end of the femur and the upper end of the tibia. At first the periosteum covers them and forms their limit; but they soon penetrate it and extend into the surrounding tissue. The characteristic position of the tumour lies between the original bone and the surface of the tumour, whether it be within or without the periosteum. . The legitimate termination of the tumour is in ossification, but it may occasionally undergo softening. Langenbeck removed such a tumour of enormous size from the arm; it contained a large cavity, which was emptied, and which would hold *four quarts* of fluid! The simple osteoid chondroma does not offer an entirely favourable prognosis; for it is heteroplastic, notwithstanding its almost homologous origin.

We have thus endeavoured to give our readers a general idea of the work now before us. If they are led to a careful perusal of the work itself, and to an honest appreciation of the labours and ability of the distinguished author, we shall be satisfied. The work abounds in excellent wood-cuts, all of which have undergone the closest scrutiny on the part of the author. A subsequent volume will be devoted to the consideration of the remainder of the subject. E. T. C.